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# Two New Species of Quiinaceae (*Quiina*, *Froesia*) from the Venezuelan Guayana and Some Remarks on the Genus *Froesia* Pires

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**ABSTRACT.** Two new species of Quiinaceae from the Venezuelan Guayana are described: *Quiina yatuensis* and *Froesia gereauana*. *Quiina yatuensis* is known from the Amazonian lowlands. The new *Froesia* species was found at high elevations in the Guayana Highlands, a center of local endemism. A key and distribution map for the species of *Froesia* Pires are given.

**RESUMEN.** Se describen dos especies nuevas de la familia Quiinaceae de la Guayana Venezolana: *Quiina yatuensis* y *Froesia gereauana*. *Quiina yatuensis* se encuentra en la Amazonía venezolana. La especie de *Froesia* se localiza a una elevación alta de la Guayana Venezolana, un centro de endemismo local. Se presentan una clave y un mapa de distribución para las especies de *Froesia* Pires.

The small neotropical family Quiinaceae is composed of medium-sized trees and shrubs, mainly located in the Amazon lowlands. At present 4 genera are recognized—*Froesia* Pires, *Lacunaria* Ducke, *Quiina* Aublet, and *Touroulia* Aublet—with about 55 species. Specimens were investigated in the context of the treatment of the family for the *Flora of the Venezuelan Guayana* (Schneider & Zizka, in prep.) and for the *Flora Neotropica*.

***Quiina yatuensis*** Julio Schneider & Zizka, sp. nov. TYPE: Venezuela. T. F. Amazonas: Dpto. Río Negro, Río Yatúa, lomerío medio escarpado, 01°33'N, 66°15'W, ca. 250 m, apr. 1991, Velasco, J. 1413 (holotype, PORT 50127). Figure 1.

Arbor parva, usque ad 8 m alta; internodiis terminalibus 2.2–3.6 × ca. 0.2 cm, compressis, pubescentibus. Folia opposita; stipulis 3.5–4.0 × 1.0–1.5 mm, triangulo-ovatis, glabris subglabrisve; petiolo 8–14 mm longo, subcylindrico, supra canaliculato; lamina 8–12 × 3.5–6.0 cm, coriacea, elliptica, ad apicem acuminata, ad basim acuto-angustata, glabra subglabrate, margine integro; nervis secundariis 8–10-jugatis, supra planis, infra prominulis. Inflorescentia fructifera solum visa, 2.0–2.5 × ca. 1.5 cm, axillaris, racemosa, 7–16-flora; axe cylindrico vel compresso, glabro subglabro; pedicellis articulatis,

usque ad 6.5 mm longis; bracteolis 0.6–0.8 × ca. 0.6 mm, ovatis subovatisve. Flos sepalis 4, in fructu persistentibus, 2.0–2.6 × 1.3–1.6 mm, ovatis vel obovatis, apice plus minusve obtusis, margine ciliolatis; petalis et staminibus non suppetentibus; ovario biloculari; stylis 2, stigmatibus oblique subpellatis. Fructus 8.0–9.0 × 6.0–7.5 mm, subglobosus, striatus, glaber, pericarpio fibroso; seminibus 1–2, 6.5–7.0 × 4.5–5.0 mm, ovato-globosis, dense villosis.

Haec species a *Q. rigidifolia* Pires fructu minore, inflorescentia pauciflora et margine foliari minus vel non revoluta; a *Q. brevensi* Pires folii textura numeroque nervorum secundariorum et inflorescentiae structura differt.

Tree to 8 m tall; terminal internodes 2.2–3.6 × ca. 0.2 cm, laterally compressed, longitudinally striate, ± pubescent, glabrescent. Leaves opposite, not or inconspicuously anisophyllous; stipules 3.5–4.0 × 1.0–1.5 mm, triangular-ovate, apically acute, ± glabrous; petiole 8–14 × ca. 2 mm, subcylindrical, canaliculate above, sparsely pubescent or glabrous; lamina 8–12 × 3.5–6.0 cm, elliptical, apically acuminate, the very apex rounded, basally tapering, glabrous, coriaceous; margin not or inconspicuously revolute, entire; secondary veins in 8–10 pairs, only abaxially prominent, separated by 0–2 conspicuous intersecondary veins. Inflorescence (fruiting) 2.0–2.5 × ca. 1.5 cm, racemose, axillary, 7–16-flowered; rachis terete or ± compressed, ± glabrous; pedicels articulate, terete, glabrous, up to 6.5 mm long; bracteoles ± ovate, apically obtuse or acute, 0.6–0.8 × ca. 0.6 mm, ciliolate, abaxially sparsely pubescent. Sepals 4, persistent in fruit, 2.0–2.6 × 1.3–1.6 mm, ovate or obovate, apically ± obtuse, ciliolate on the margin; petals and stamens unknown. Ovary 2-locular; styles 2, 1.3–1.8 mm long; stigmas obliquely subpellate. Fruit 8.0–9.0 × 6.0–7.5 mm, subglobose, longitudinally striate, glabrous, with rounded apex; seeds 6.5–7.0 × 4.5–5.0 mm, subglobose to ovate, densely villous.

**Distribution.** Venezuela, Amazonas (Dpto. Río Negro).

*Quiina brevensis* Pires closely resembles *Q. yatuensis* in leaf and stipule shape. However, leaf texture, number of secondary veins (*Q. brevensis*: 9–




Figure 1. *Quiina yatuensis* Julio Schneider & Zizka. —A. Fruiting branch. —B. Stipules and bracts at terminal bud. —C. Inflorescence with one fruit (scale: A = 1 cm, B = 1 mm, C = 5 mm). Drawings from Velazco 1413 (by J. Schneider).

15, *Q. yatuensis*: 8–10), and inflorescence structure are different (*Q. brevensis*: lateral branches 1–5-flowered; *Q. yatuensis*: inflorescence apparently unbranched, rarely with one branch from the very base). Because up to now *Q. brevensis* is known only from staminate specimens, its fruit shape is unknown.

Leaf shape and texture as well as stipule shape of *Q. yatuensis* are similar to *Q. rigidifolia* Pires, which is distinguished by having inflorescences with more flowers (*Q. yatuensis*: 7–16, *Q. rigidifolia*: 25–>30), a broader rachis (*Q. yatuensis*: 0.7–1.0 mm, *Q. rigidifolia*: 1.2–2.0 mm), distinctly larger fruits (*Q. yatuensis*: 8.0–9.0 × 6.0–7.5 mm, *Q. rigidifolia*: ca. 3 × 2.5 cm), and a more conspicuously revolute leaf margin.

**Froesia gereauana** Julio Schneider & Zizka, sp. nov. TYPE: Venezuela. T. F. Amazonas: Dpto. Atures, Lomas graníticas, Caño Piedra, 115 km al SE de Pto. Ayacucho, 4°54'N, 66°54'W, 1500 m a.s.l., sep. 1989, Fernandez, A., Sanoja, E. & Yanez, M. 5982 (holotype, MO 3948561; isotype, PORT). Figure 2.

Arbor 9–12 m alta. Folia 27-foliolata; stipulis incognitis; petiolulis (5–)9–18 × 2.0–2.7 mm; foliolis oblongis vel ovatis, acuminatis, 24–31 × 6.5–9.0 cm, coriaceis, supra glabris nitidisque, infra praeter trichomata inconspicuos secus nervos secundarios glabris; nervis secundariis (27–)40–57-jugatis, inter se 4–6(–7) mm distantiibus; margine ad basim integro, ad apicem crenulato-serrulato. Inflorescentia terminalis, erecta; axe subcylindrico, crasso, piloso; pedicellis ad basim articulatis. Flos hermaphroditus; sepalis 5, 7–8 mm longis, in fructu persistentibus, suborbicularibus, extus pilosis, intus pilosulis; petalis non suppetentibus; staminibus numerosis. Fructus follicularis, 1.7–2.0 × ca. 1.5 cm, ex carpellis maturis 1–3 constans; pericarpio fibroso; seminibus subglobosis vel ellipsoideis, nigris, ca. 1.4 × ca. 1.2 cm.

Haec species a *Froesia venezuelensi* numero distante aquae nervorum secundariorum, foliorum textura et margine basi integro, apicem versus minus conspicue crenulato-serrulato differt.

Trees 9–12 m tall, unbranched. Leaves crowded at stem apex; stipules unknown; petiole over 30 cm long, 1.0–1.2 cm thick at base, lenticellate, inconspicuously and shortly pilose; leaflets ca. 27, (1.8–)2.2–5.0 cm apart; petiolule (5–)9–18 × 2.0–2.7 mm, opposite to alternate; blade 24–31 × 6.5–


9.0 cm (leaflets of fourth and fifth pair from apex 26–31 × 7.5–9.0 cm, terminal leaflet ca. 24 × 7.5–8.5 cm), coriaceous, oblong to ovate, acuminate, rounded and ± asymmetric at base, adaxially glabrous and glossy, abaxially glabrous on surface, inconspicuously hairy on secondary veins; margin apically ± crenulate-serrulate, basally entire; venation craspedodromous, (27–)40–57 pairs of secondary veins (apical leaflets (27–)43–57, terminal leaflet 40–43), 4–6(–7) mm apart; tertiary veins percurrent, numerous, forming an s-shaped curve, parallel and densely spaced (terminology after Hickey, 1979). Inflorescence terminal, thyrsoid, branches of second order usually short, thus the flowers appearing ± fascicled at the branches of first order; rachis lenticellate, densely villous with short brownish trichomes. Primary bracts ca. 5.0 × 2.5 mm, narrowly triangular, acute, pilose abaxially; bracteoles ca. 2.5 × 1.0 mm; similar to primary bracts in shape and indumentum but smaller; pedicels densely pilose, articulated at base. Flowers bisexual; sepals 5, 7–8 mm long, suborbicular, unequal, persistent and reflexed in fruit, pilose abaxially, pilosulous adaxially; petals unknown; stamens numerous, the filaments filiform, 5–6 mm long, the anthers ellipsoid, ca. 0.8 × 0.4 mm. Fruit composed of 1–3 fully developed follicles (up to 2 carpels aborting); follicles 1.7–2.0 × ca. 1.5 cm when ripe, ± globose to pyriform, the surface shortly pilose, longitudinally furrowed; pericarp fibrous, hard, opening with a longitudinal slit; seed 1 per follicle, ca. 1.4 × 1.2 cm, ± globose, black.

**Distribution.** Venezuela, Amazonas (Dpto. Atures).

Differentiation of the species of *Froesia* principally relies on leaf characters; in the reproductive parts, no character seemed reliable enough to us to discern the species (and knowledge of variability in floral parts is especially scarce). Texture, indumentum, and margin of leaflets as well as their number and distance between secondary veins seem to be especially helpful. *Froesia gereauana* approaches *F. venezuelensis*, differing from the latter in more strongly indurated leaflets with apically less conspicuously crenate-serrate margins, and especially

Figure 2. *Froesia gereauana* Julio Schneider & Zizka. —A. Rachis of leaf with leaflet from apical part of leaf. —B. Leaflet margin near apex. —C. Branch of inflorescence with fruits. —D. Branchlet of inflorescence with basal parts of pedicels. —E. Fruit with two ripe opened follicles, 1 carpel aborted; the sepals are persistent and reflexed in fruit. —F. Seed (scale: A = 2 cm, B = 4 mm, C = 2 cm, D = 2 mm, E, F = 1 cm). Drawings from Fernandez, Sanoja & Yanez 5982 (by J. Schneider).





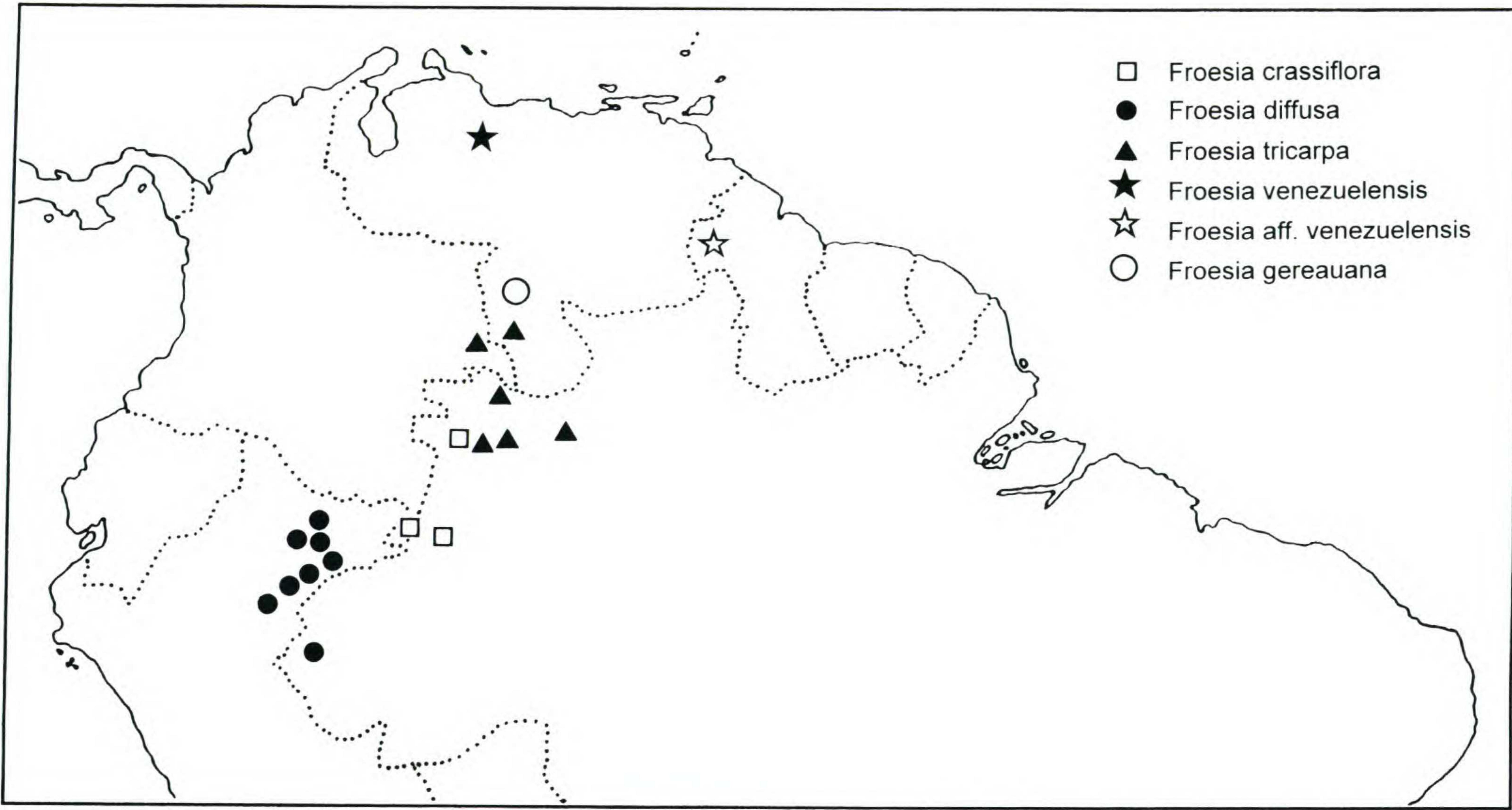


Figure 3. Distribution of *Froesia* species (map by M. Middeke).

in more numerous and less distant secondary veins per leaflet.

The species is named after Roy E. Gereau, who had annotated the type specimen as a potentially new species.

#### THE GENUS *FROESIA* PIRES

Since the description of *Froesia tricarpa* Pires and *F. crassiflora* Pires & Fróes (Pires, 1948, 1950), two comparatively recent publications have dealt with the genus *Froesia* (Steyermark & Bunting, 1975; Gereau & Vásquez, 1994), adding to it the new species *F. venezuelensis* Steyermark & G. S. Bunting and *F. diffusa* Gereau & Rod. Vásquez. Besides the apocarpous gynoecium, the genus is unique in the family in having bisexual flowers, glabrous seeds, a peculiar wood anatomy (Gottwald & Parameswaran, 1967), and interpetiolar stipules divided into 4–6 setose, acute parts. Nevertheless, leaf venation and anatomy display striking similarities to other Quiinaceae and justify maintaining *Froesia* within the family.

In contrast to the two easily separated species of

*Touroulia* (the other genus of the Quiinaceae displaying a caulirosulate habit), *Froesia* species form a close-knit group of morphologically and anatomically allied taxa, differing principally in plant and leaf size, texture, shape, venation and indumentum of leaflets, as well as indumentum of follicles.

Three *Froesia* species have a limited distribution in the Amazonian lowlands: *F. crassiflora*: Colombia, Brazil; in caatinga formations or on sandy banks bordering swampy forests (Steyermark & Bunting, 1975). *Froesia diffusa*: Peru, Brazil, 100–200 m a.s.l.; primary lowland forests on clayey soils ("suelos arcillosos") in western Amazonia. *Froesia tricarpa*: Colombia, Venezuela, Brazil, 120–300 m a.s.l.; in savanna and dwarf caatinga forests. *Froesia venezuelensis* is restricted to cloud forests in northern Venezuela, 1000–1300 m a.s.l.; the newly described *F. gereauana* occurs at even higher elevations (1500 m) in the Venezuelan Guayana. An isolated collection from Guiana, upper Mazaruni River Basin, 1220 m a.s.l. (Tillett, Tillett & Boyan 45131; K, NY) is at present regarded as conspecific with *F. venezuelensis* (Fig. 3).

#### KEY TO THE SPECIES OF *FROESIA*

1. Lower surface of leaves densely pilosulous to puberulous . . . . .	<i>Froesia crassiflora</i> Pires & Fróes
1'. Lower surface of leaves glabrous, sometimes with inconspicuous short rigid hairs pointing toward apex on and along the secondary veins . . . . .	2
2(1). Leaflets 11–15 . . . . .	3
2'. Leaflets 17–ca. 27 . . . . .	4
3(2). Petiole 33–54 cm long; leaflets 13–21, basally subcrenate to entire, apically serrulate, chartaceous, 21–32 × 7.5–11.5 cm, (21–)26–38 pairs of secondary veins; leaves 104–133 cm long . . . . .	<i>Froesia venezuelensis</i> Steyermark & G. S. Bunting
3'. Petiole 10–29 cm long; leaflets 11–15, serrate, even at base, chartaceous to coriaceous, (10–)16–26 × 5–9 cm, 18–29(–31) pairs of secondary veins; leaves 40–100 cm long . . . . .	<i>Froesia tricarpa</i> Pires
4(2). Leaflets coriaceous, with (27–)40–57 pairs of secondary veins, these 4–6(–7) mm apart . . . . .	<i>Froesia gereauana</i> Julio Schneider & Zizka
4'. Leaflets chartaceous, with 17–38 pairs of secondary veins, these 6–10(–14) mm apart . . . . .	5
5(4). Leaflets basally subcrenate to entire, apically serrulate, margins flat; terminal leaflet 24–29 cm long; inflorescence up to ca. 42 cm long (northern Venezuela; Guiana?) . . . . .	<i>Froesia venezuelensis</i> Steyermark & G. S. Bunting
5'. Leaflets basally entire, apically ± subcrenate, margins ± crisp (when dry), terminal leaflet 15–23 cm long; inflorescence 80–120 cm long (western Brazil, Peru) . . . . .	<i>Froesia diffusa</i> Gereau & Rod. Vásquez

**Investigated specimens.** ***Froesia crassiflora*** Pires & Fróes: COLOMBIA: Schultes & López 10401c (US). BRAZIL: Fróes 24056 (F, K), 28194 (NY), Schultes & López 9818 (US). ***Froesia diffusa*** Gereau & Rod. Vásquez: PERU: Vásquez, Arévalo & Jaramillo 7538 (MO, NY), 7731 (MO); Vásquez & Jaramillo 3198 (NY), 6791 (MO, NY), 7252 (MO, NY), 9629 (MO); Vásquez, Ortíz & Jaramillo 14124 (US); Vásquez, Ruiz & Jaramillo 6555 (G, MO, NY); Vásquez & Soto 11874 (G, MO, NY). BRAZIL: Prance et al. 12455 (K, MO, S, US). ***Froesia gereauana*** Julio Schneider & Zizka: VENEZUELA: Fernandez, Sanoja & Yanez 5982 (MO, PORT). ***Froesia tricarpa*** Pires:

BRAZIL: Fróes 22810 (F), 28290 (S); Maas et al. 6833 (NY); Nascimento, Pires & Coradin 148258 (MO); Pires 944 (F, US); Pires & Marinho 15671 (MO); Schultes & López 9555 (K, NY, US), 9682 (US). COLOMBIA: Schultes, Baker & Cabrera 18152 (US). VENEZUELA: Bunting, Akkermans & van Rooden 3947 (U, VEN). ***Froesia venezuelensis*** Steyermark & G. S. Bunting: VENEZUELA: Schneider 1 (FR, VEN), 2 (FR, VEN); Steyermark & Bunting 105237 (K, NY, US, VEN), 105246 (NY, US, VEN); Steyermark, Bunting & Wessels-Boer 100282 (NY, S, VEN). ***F. aff. venezuelensis***: GUIANA: Tillett, Tillett & Boyan 45131 (K, NY).

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